

REMARKS

Claims 1-8, 10-14, 16-18, 20, 22, 30-39, 41-45, 48, 50-58, and 63-65 will be pending upon entry of the present amendment. Claims 16, 36, 42, 50 and 63 are amended. No new matter has been added to the application.

The specification has been amended, in part, to correct drafting errors. In particular, the description of the process outlined in the flow chart of Figure 11 has been corrected so as to be consistent with the illustrated process. Figure 11 fully supports the substantive changes to the text, which therefore do not constitute new matter. Additional changes are to correct typographical errors, and to provide language to support specific language used in the claims. These changes, also, are fully supported by the specification and drawings as originally filed, and do not constitute new matter.

Claims 16, 36, and 42 are amended to more clearly distinguish the claimed inventions over the art of record. Additional amendments to claim 16, and to claim 63, are made to correct drafting and typographical errors.

Discussion of Rejections Under 35 U.S.C. § 112

Claims 1-8, 10-14, 16-18, 20, 22, 30-39, 41-45, 48, 50-58, and 63-65 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner points to the speed threshold and similar language of claims 1, 16, 30, and 42, and the language of claims 36 and 63 reciting “comparing a rate of change of position with a rate of change threshold,” as lacking support in the specification. The Examiner indicates that the specification does not disclose that the clicking functions are based on any speed threshold.

Applicant respectfully disagrees, and believes that the claim language is fully supported by the specification. *Rate of change* can be defined as the amount of change (c) of a value (z) over a selected period of time (t): cz/t . *Speed* can be defined as distance traveled (d) over a selected period of time (t): d/t . If *distance traveled* is understood as referring to the value of a change of position, and if *position* is used as the value z of the rate-of-change formula, then

speed is a species of *rate of change*. The term *variation speed*, as used in the specification (page 8, line 8), can also be understood as referring also to rate of change, i.e., the speed at which a value varies.

As the Examiner notes in the Office Action, right and left clicks are detected if the difference $X - XOLD$ is, respectively, higher than the positive clicking threshold THC or lower than the negative clicking threshold $-THC$, and other click commands are similarly detected when $Y - YOLD$ is higher or lower than the respective clicking thresholds. The use of such thresholds to control decision points in a process is inherently related to a speed of movement or rate of change of position.

As the specification explains, the cycle of the flow chart of Figure 11 is repeated until the device is switched off. In systems that employ microcontrollers, such as that of the present application (see page 9, line 4), a “clock” is provided that produces a continuous chain of evenly spaced pulses to control the processor of the system, permitting the execution of sequential logic operations in a prescribed order. Whether any given step requires one clock pulse or many clock pulses for its execution, the process moves in a regular and orderly manner step-by-step through the cycle. Thus, it is inherent, in such a process, that the repetition of the cycle will have a frequency value associated with it, meaning that the entire cycle will be repeated at a definable rate.

Referring now to lines 13 and 14 of page 9 of the specification, the X and Y signals of the flow chart of Figure 11 are shown to be digitized output signals of accelerometers 20, 30. These are shown in Figures 8-10, in which reference number 20 refers to a 2-axis accelerometer while number 30 refers to 1-axis accelerometers. Using the embodiment of Figure 8 as a representative example, accelerometer 20 of the device 7 generates output signals X and Y *proportional to the tilting angle of a pointing device around respective axes A and B* (see page 6, lines -28). Thus, the X and Y signals of step 52 of Figure 11 are numerical values that correspond to the instantaneous angle of rotation of the pointing device with respect to axes A and B, respectively.

In addition to the clicking threshold THC , the microprocessor also holds the immediate prior detected X and Y signals, as values $XOLD$ and $YOLD$ (see page 10, line 28-

page 11, line 2). When a new set of values for X and Y are received from the accelerometer 20, at step 52 of Figure 11, the difference between the new value X and the stored value XOLD is determined by subtracting XOLD from X. This will be a positive value if X is greater than XOLD, or a negative value if XOLD is the greater. The resulting value (or derivative), is then compared to the click threshold THC to determine whether a click command is detected (steps 54 and 58). The Y value is processed in a similar manner in steps 66 and 70.

At step 78, the value for XOLD is updated by replacing the previous value with the value of X, and the YOLD value is likewise updated. Thus, every time the cycle is repeated, new values for XOLD and YOLD are saved, and used in the next cycle for comparison. Accordingly, in order for the difference of X-XOLD to be greater than THC, the angle of rotation of the device 7 must be changed by a value that is greater than the value stored as THC, in the time period between the beginning of one cycle and the beginning of the next cycle. So if, for example, the cycle frequency were ten cycles per second, and the threshold THC were a value corresponding to five degrees, the input device would need to be moved more than five degrees in less than one tenth of a second (the time between the beginning of one cycle and the beginning of the next) in order to input a click command. Thus, in this example, the threshold THC can be represented as being equal to a change (c) of value of 5° over .1 seconds: $c5^{\circ}/.1s$. This is clearly a rate-of-change equation. When considered with the use of terms such as *variation speed* (page 8, line 8), and *rapid head movements* (to distinguish clicking from pointer control, page 8, lines 9-12), it is clear that the rate-of-change threshold THC can be applied as a speed threshold. For these reasons, Applicants believe that the currently pending claims are allowable under 35 U.S.C. § 112, first paragraph.

Claim 50 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, due to lack of antecedent basis. Claim 50 has been amended to provide appropriate antecedence.

Interview Summary

Applicants thank Examiner Liang for her consideration in conducting an interview with the undersigned representative on January 23, 2008, in which aspects of the claimed invention were discussed in relation to the Bartlett reference. Examiner Liang asked

that the Applicants' position, in particular regarding the operation of Bartlett as it compares to the claimed invention, be submitted in writing to permit her to make a deliberate analysis of the matter.

In the discussion that follows, when a specific passage of the Bartlett reference is cited, it will be indicated by a column number separated from a line number by a colon, e.g., 4:22, indicating column 4, line 22.

Bartlett teaches two general kinds of commands: position commands, which are correlated directly to an angular orientation of its device, and that are executed instantaneously (3:24-29); and gesture commands, which comprise a series of unique movements over a fixed time period, and that are executed at the end of the time period (3:29-34, 6:49-54). Bartlett acknowledges that a given gesture command may be confused for a series of position commands, inasmuch as a gesture command may comprise a number of changes of position, but can only be detected at the end of the fixed time period, while position commands are detected and executed instantaneously (6:54-58). Bartlett addresses this problem by tracking the movements of its device over the fixed time period, while executing any position commands that occur. At the end of the time period, it compares the combination of movements and position changes with a catalog of gesture commands, and if it determines that a gesture command was made, it executes the gesture command according to the state the device was in at the beginning of the time period (4:55-60, 7:6-19). In other words, it executes the apparent position commands contained in the gesture command as they occur, but reverses the position commands back to the beginning of the time period if it determines that a gesture command was made. If it does not detect a gesture command, it allows the preceding position commands to stand. In order to do this, Bartlett must hold in its memory every state of its device over a period of at least as long as the fixed time period required to detect a gesture command, so that it can return to the state it was in when the command began.

Turning now to the process disclosed with reference to the embodiment of Figure 11 of the present application, some aspects of the present invention will be discussed. Initially, thresholds for a click function (THC), X position (THX), and Y position (THY), and multipliers (Kx and Ky) are established (step 50). Referring again to the example used above, in which the

accelerometer 20 generates output signals X,Y proportionate to the tilting angle of the device 7 around axes A and B, the values of X and Y correspond to angles of orientation around respective axes. At step 52, X and Y signals corresponding to the current position of the device are received, and the X signal is compared to the previous value of X (XOLD) (steps 54, 58). If the difference, X minus XOLD, exceeds the click threshold THC, a click command is detected (steps 56, 60), and if it does not, the process moves to step 62, where the absolute value of X is compared to the X threshold THX. If the absolute value of X exceeds the threshold, a cursor movement command is detected, and the cursor is moved from its current position (OLDX_POS) a distance that is determined by multiplying the value of X by the multiplier Kx. In this way, as the value of X increases, the distance that the cursor moves for each cycle of the process increases, and the rate at which the distance increases can be controlled by adjusting the multiplier Kx. Also, if the device is held at an angle that exceeds the threshold THX, the cursor will move at a steady rate until the angle of the device changes.

The process steps 66-76 relate to Y axis operation, and correspond in operation to the X axis operation described with reference to steps 54-64. At step 78, the previous values of X and Y (XOLD, YOLD) are updated, and the previous X and Y values for the cursor position (OLDX_POS, OLDY_POS) are also updated, before restarting the process.

In order to perform a click command, a user must change the position of the device far enough to exceed the click threshold *between one cycle of the process and the next*. This determination is made at the beginning of each cycle, before consideration of any cursor movement commands.

Looking specifically at Bartlett's gesture commands, and the process Bartlett uses to distinguish between its position commands and its gesture commands, there are some important elements that distinguish between Bartlett and the present invention as represented by the embodiment described above. First, while any of Bartlett's gesture commands will include a speed of movement component, these cannot be considered thresholds. Referring for example to Bartlett's Figure 1, a representative gesture command is plotted over time. Assuming the device is moved or tilted at a speed that corresponds to the slope of the line, the action will be interpreted as a gesture command. However, if the device were tilted *more quickly* than the

slope indicated, but otherwise conformed to the plotted line, the device would not recognize that series of movements as a gesture command, but would treat it as a series of position commands. Thus, the particular rate of movement of the gesture cannot be considered a rate of movement threshold, inasmuch as it only captures movements that fall within a particular narrow range, and does not captures such movements that exceed or fall below that range. This is in contrast to the above described process of Figure 11 in which a rate of movement threshold is provided, beyond which no cursor movement commands are detected.

Second, it is inherent that Bartlett's gesture commands must begin and end at a neutral position. If this were not so, i.e., if a user were required to rotate the device away from neutral before beginning a gesture command, or to end a gesture command with the device rotated away from neutral, it would inevitably result in unwanted position commands being executed before or after the gesture command. This is consistent with Bartlett's disclosure, and in particular with reference to each of the five examples of gesture commands given, described with reference to Bartlett's Figures 1 and 2a-2d. In contrast, the click commands described above can begin or end at any point, inasmuch as they are based on a comparison of one position signal with the previous position signal (Figure 11, steps 54, 58, 66 and 70).

Third, in order for Bartlett's process to recognize and execute a gesture command, a fixed time period is required, over which several position commands may be identified and executed before it is determined that a gesture command was entered, at which point it is necessary to reverse the effects of each of the misinterpreted movements. This is significantly different from the process of Figure 11 discussed above, in which no cursor movement command is detected or executed until after the comparison is made to detect a click command. If a click command is detected, no cursor movement command will be executed in response to the same movement.

These distinctions provide some significant advantages of the Applicants' process over Bartlett's process. First, the likelihood of confusion is greatly reduced. For example, the Applicants' process first determines whether a click command has been entered, then determines whether a cursor movement command exists, and therefore does not execute a cursor movement command unless the criteria for a click command are not met. In contrast, Bartlett executes all

position commands and then compares the associated movements with its catalog to determine whether they were in fact intended as a gesture command, in which case it reverses the erroneously executed position commands. If a user is attempting to enter a gesture command into Bartlett's device, she may observe the execution of perceived position commands on the screen of the device and believe that she has made a mistake. If she then falters during the gesture command, or otherwise fails to properly complete the command, this will break the correct series of movements, resulting in a failure of the device to detect the command, which in turn will prevent the reversal of the previously executed position commands. Thus, before the user can reattempt a failed gesture command, she must first manually reverse each unintended position command. This creates a process that is much more complex and difficult for the user, and fraught with the possibility of error.

Second, Bartlett's device must hold in its memory every change of state for a period long enough to detect a gesture command, while the process of Figure 11 requires only that the most recent values of X and Y (XOLD, YOLD), and the most recent cursor positions (OLDX_POS, OLDY_POS) need be held in memory.

Third, the processing requirements for Bartlett's process are significantly greater than those of the Applicants' process, requiring a comparison of every series of movements with a catalog of gesture commands (4:55-60), each of which may include a large number of complex elements. This is in contrast to the process of Figure 11, which merely requires comparisons with thresholds to determine how to interpret an action.

Fourth, operation of a device according to an embodiment of the present invention can be must faster than with Bartlett. Assuming that the same actions associated with various of Bartlett's gesture commands are associated with respective ones of the click commands of the described process, each click command and each cursor movement command can be executed instantly, while Bartlett's gesture commands each require an extended and fixed time period, even if the actual motion of the gesture command is simple and brief. Accordingly, the user must wait the full length of the time period before proceeding to a next position or gesture command.

In view of the significant distinctions described above, Applicant's believe that the allowability of the claims can be more easily recognized, as discussed hereafter.

Summary of Rejections Under 35 U.S.C. § 103

Claims 1-8, 10-14, 16-18, 20, 22, 30-39, 41-45, 48, 50-58, and 63-65 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bartlett (U.S. Pat. 6,573,883) in view of one or more of Lee et al. ("Two-Dimensional Position Detection System with MEMS Accelerometer for MOUSE Applications," hereafter *Lee*), Svancarek (U.S. Pat. 6,249,274), Kuga (U.S. Pat. 5,701,131), Davison (U.S. Pat. 4,682,159), and Odamura (U.S. Pat. 6,765,553).

Applicants note that each of the claim limitations argued below with respect to the independent claims 1, 16, 30, 36, 42, and 63 are pointed to as being taught by Bartlett, and the Examiner does not argue that any of the other art of record teaches these particular limitations. Furthermore, Applicants do not believe that any of the references cited in combination with Bartlett to reject the claims teaches or suggests the particular limitations discussed, and that, if Bartlett fails to teach or suggest any of these limitations, the respective claims are allowable over the remaining art. Accordingly, Applicants' arguments will be primarily limited to addressing the limitations as they relate to Bartlett.

Discussion of Rejections Under 35 U.S.C. § 103

Bartlett fails to teach or suggest the limitation of claim 1 that recites "a microcontroller ... configured to generate first control signals correlated to said positions, *only* while detected movements of said body are less than a speed of movement threshold" (Emphasis added.) The Office Action points to Bartlett's *position commands* as corresponding to the *first control signals* of claim 1. If, arguendo, Applicants accept this correlation, then in order to teach or suggest the limitations of claim 1, Bartlett must generate its position commands *only* if the speed of movement of its device is lower than a selected threshold. In other word, if Bartlett generates position control signals while any detected movements exceed a threshold, it fails to properly teach or suggest the claimed invention. As described in more detail above, Bartlett fails for at least two reasons: first, Bartlett generates and executes all position controls,

then only later reverses the action if it is determined that a different command was intended. Thus, Bartlett's position commands are not generated only if the speed of movement is below a threshold, but are instead generated without consideration of the speed of movement.

Second, if Bartlett's device is moved *faster* than a given gesture command requires, the comparison of the movement with the catalog of gesture commands would not correlate the movement with the gesture command, so it would be treated as a position command.

In rejecting claim 1, the Examiner points to Figures 2a-2d and indicates that at less than a speed threshold of movement, no gesture command is detected, further stating that "the gesture commands ... correspond to a speed threshold, e.g., in Fig. 2a, the quick movement of the handheld has to be greater than the angular orientation about the axis of rotation during the time interval between T_s - T_f , an activation signal is detected, otherwise, the activation signal is not detected."

Applicants disagree with this reasoning for two reasons: first, Bartlett does not require that the movement be *greater* than some value to be seen as a gesture command, but instead requires that the movement be *equal* to the value, making allowance for minor variations (4:60-63). If the movement is *either* greater than or less than the value, there will be no gesture command detected; second, claim 1 is not directed to detection of a gesture (or click) command, so whether Bartlett detects a gesture command is not relevant. Instead, the claim is directed to the detection of commands correlated to positions, requiring that such be generated "only while detected movements of said body are less than a speed of movement threshold." Thus, the question is not whether Bartlett generates a gesture command below the threshold, but whether it generates a position command *above* the threshold. Even if it were assumed that the gesture command of Bartlett's Figure 2a represented a speed of movement threshold, and that the device was moved at exactly the speed and orientation of that gesture, Bartlett would still generate and execute the position commands inherent in the movement, and would then reverse the commands after T_f , when it was determined that a gesture command had been made. And if the device were moved *faster* than the plot of Figure 2a, Bartlett would generate and execute the position commands and would not recognize a gesture command (see 7:6-36). In either case, Bartlett

teaches away from generating first control signals *only* while detected movements are less than a speed of movement threshold, as recited in claim 1, by generating a position command while detected movements are greater than the threshold. Bartlett cannot teach or suggest the cited limitation of claim 1, and Lee, cited in combination with Bartlett in rejecting claim 1, is entirely silent with regard any control signal generation, and therefore cannot provide such a teaching. Thus, claim 1 is allowable over Bartlett in combination with Lee.

Independent claim 16 recites, in part, “sending pointer control signals to the electrical appliance corresponding to the axis and amplitude of position of the device only when the amplitude of position exceeds the amplitude threshold but the rate of change does not exceed the speed threshold.” Bartlett fails to teach or suggest this limitation of claim 16, because, as previously demonstrated, Bartlett sends its position commands without regard for rate of change. The fact that they may later be reversed if the movements match a specific pattern is not relevant, because Bartlett does not distinguish between different commands on the basis of rate of change, but sends all signals as position commands, even when a gesture command is intended, regardless of the rate of change. Lee is silent with regard to sending signals, and cannot remedy Bartlett’s failure. Accordingly, claim 16 is allowable over Bartlett in combination with Lee.

Independent claim 30 recites, in part, “producing control signals corresponding to the movement signals, and suitable for moving a pointer on a computer screen, *provided* the movement of the body does not exceed a speed threshold.” (Emphasis added.) Because Bartlett produces position commands without regard to whether movement exceeds a speed threshold, it fails to teach or suggest this limitation of claim 30. Lee cannot provide the missing teaching, and so claim 30 is therefore allowable.

Independent claim 36 recites, in part, “a microprocessor ... configured to compare a rate of movement of the pointing device to a threshold and, *only* if the rate of movement of the pointing device does not exceed the threshold, convert the position signals of the MEMS sensor to control signals suitable for controlling position of a pointer on the computer screen.” (Emphasis added.) Bartlett converts its movements to position commands regardless of any rate of movement threshold, and thus fails to teach or suggest this limitation of claim 36. Lee fails to teach conversion of position signals to control signals, and is silent with regard to any threshold,

including a rate of movement threshold. Claim 36 is therefore allowable over Bartlett in combination with Lee.

Independent claim 42 recites, in part, “a circuit configured to produce a cursor movement command in a first direction, corresponding to a value of the first signal, *only* when the first signal indicates rotation of the body that is lower than a speed threshold, and to produce a first function command when the first signal indicates rotation of the body that exceeds the speed threshold.” (Emphasis added.) In view of previous comments, it will be clear that Bartlett fails to teach or suggest this limitation of claim 42. Odamura, cited in combination with Bartlett in the rejection of claim 42, is silent regarding the use of a threshold to distinguish between different commands, and is also silent with regard to the use of a speed threshold for any purpose. Accordingly, claim 42 is allowable over a combination of Bartlett and Odamura.

Claim 63 recites, in part, “only if the rate of change does not exceed the rate of change threshold, produce a pointer control signal corresponding to a direction of movement of the body.” Bartlett does not impose any threshold to production of its position commands, and thus fails to anticipate claim 63. Lee is likewise silent regarding a rate of change threshold, and is also silent with respect to the production of a pointer control signal. Accordingly, claim 63 is allowable over Bartlett, in combination with Lee.

Overall, the cited references do not singly, or in any motivated combination, teach or suggest the claimed features of the embodiments recited in independent claims 1, 16, 30, 36, 42, or 63, and thus such claims are allowable. If the undersigned representative has overlooked a relevant teaching in any of the references, the Examiner is requested to point out specifically where such teaching may be found.

In light of the above amendments and remarks, Applicant respectfully submits that all pending claims are allowable, and therefore requests that the Examiner reconsider this application and timely allow all pending claims. Examiner Liang is encouraged to contact Mr. Bennett by telephone at (206) 694-4848 to discuss the above and any other distinctions between the claims and the applied references, and to address any informalities that may remain unresolved.

Application No. 10/685,292
Reply to Office Action dated November 14, 2007

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,
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